

REMARKS

Claims 1-3, 6-11, 14-27, 30-35, 38-40 and 49-58 are pending in the present application. No claims are withdrawn from consideration, no claims have been cancelled, no claims have been amended, and no new claims have been added. Accordingly, the claims listed above are currently under consideration. Amendment and cancellation of certain claims is not to be construed as a dedication to the public of any of the subject matter of the claims as previously presented. No new matter has been added.

Rejections under 35 USC § 103

Claims 1-3, 6, 7, 9-11, 14, 15, 17-23, 25-27, 30, 31, 33-35, 38, 39, 49-51 and 54-57 were rejected under 35 USC § 103(a) as allegedly being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams (US 4,422,925).

Applicant respectfully traverses the rejection on two bases: (1) the data generated by Dr. Xu Youhao and discussed in the accompanying declaration support a conclusion that the invention is not obvious from the cited references, and (2) the rejection is insufficient to establish a prima facie argument of unpatentability. Each of these bases is discussed below.

(1) Data show the invention is not obvious

Accompanying this response is the declaration of Dr. Xu Youhao, an inventor of the presently claimed subject matter and a person having twenty years of experience with catalytic cracking. Dr. Youhao's declaration is based in part in his previous declaration, and the declaration now contains three examples of the invention for reactors having ratios of diameter of second reaction zone to diameter of first reaction zone of 4:1, 2:1, and 1.5:1, a new comparative example in which the ratio of diameter of second reaction zone to diameter of first reaction zone is 1.2:1, and an explanation of why Dr. Youhao's explanation involving gas density in the previous declaration was correct. The Examiner's thoughtful review and analysis of the declaration and arguments are appreciated, and Applicant provides this further explanation for the Examiner's consideration.

Dr. Youhao comments that the results of the invention are unexpected (paragraph 7), and Dr. Youhao provides data in Tables 3 and 4 that summarize values for the unexpected increase in isoparaffins. In view of Dr. Youhao's conclusion and the data, Applicant submits that the claimed invention is patentable over the cited references.

Dr. Youhao's declaration also addresses the incorrect conclusion in the Office Action that densities ρ_1 and ρ_2 of gas are not approximately the same. The Office Action mistakenly concluded that there was an error in Dr. Youhao's previous declaration based on data found in US 3,246,960. As explained in Dr. Youhao's declaration, the cited reference provides values for densities that are based on weight of catalyst present in the gas stream as well as weight of gas measured at various points in the reactor (the density of the "suspension" at a given point). Dr. Youhao's calculations involve gas density only, excluding solids in the gas stream, and Dr. Youhao includes calculations showing that densities ρ_1 and ρ_2 of gas are approximately the same. Consequently, the information in the previous declaration was correct.

(2) References are insufficient to establish prima facie argument of unpatentability

The Office Action alleges that the claimed subject matter is obvious because Kmecak et al. discloses a conventional reactor and because Williams states at column 4 lines 21-29

In each of the reactor sections 9, 10, 11 and 12, reaction conditions suitable for substantially optimum conversion of the various hydrocarbon feedstreams introduced into the successive sections of the riser reactor to the desired products may be obtained by variations in vapor velocity, catalyst loading, feed preheats, and regenerator temperature. The length and diameter of the various sections of reactor 2 are proportioned to maintain a desired reaction time in each section.

The Office Action further asserts that "it would have been obvious for one of ordinary skill in the art at the time the invention was made to select the recited dimensions for each of the prelift zone, the first reaction zone and the second reaction zone in the riser reactor of Kmecak et al.,

on the basis of suitability for the intended use, because changes in size merely involves routine skill in the art, *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955). Additionally, the precise dimensions of the respective zones of the riser reactor would have been considered a result effective variable by one having ordinary skill in the art, as evidence by Williams.”

An Office Action must establish a clear connection between the variable changed and the result obtained to establish a prima facie argument of unpatentability based on a rationale of optimization. MPEP 2144.05(B) states “A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. In *re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).”

The language from Williams quoted above is directed primarily to a method of maximizing olefins, especially C₂-C₃ olefins, when read in context (see e.g. 3:38 – 4:54 for the context in which the language quoted above is discussed in Williams). Consequently, at best, Williams is stating in the language quoted above that one of ordinary skill would select the residence time desired in the various sections to maximize olefin production and adjust the length and diameter of sections accordingly. This is not enough to lead a person of ordinary skill to Applicant’s claimed subject matter. The Office Action does not explain why someone would adopt a reactor having the dimensions specified in Applicant’s claims to maximize olefins.

Further, as Dr. Youhao has stated in his declaration, a person of ordinary skill would especially not provide a reactor with a ratio of diameter of second reaction zone to diameter of first reaction zone of 1.5:1 or greater (e.g. paragraphs 6.2 and 6.3 of the declaration; see also pp. 13-24 of the declaration, in which he explains that a person of ordinary skill would not adopt the specified ratio of diameters). The adoption of a reactor with dimensions specified in Applicant’s claims goes against conventional wisdom under Dr. Youhao’s explanation.

It is also not clear how what Williams teaches would lead a person of ordinary skill to Applicant’s claimed riser reactor, in which production of paraffins rather than olefins may be

increased. Williams states that one can change obtain “optimum conversion” in each stage by adjusting other variables in a known way to obtain that “optimum conversion.” However, Williams’ optimization favors production of olefins, not paraffins (see e.g. col. 2 lines 13-18 (“The products of the process of this invention contain a relatively greater proportion of olefins suitable for alkylation or other petrochemical processes than are obtained from transfer line cracking of liquid feedstocks in the absence of the normally gaseous hydrocarbons.”)). Williams says nothing about how one might optimize production of isoparaffins as opposed to olefins and especially to the C2 to C3 olefins that appear to be the focus of Williams (see, e.g. col. 3 lines 49-53, where Williams indicates that C2 and C3 olefins are especially favored in section 10 of Williams’ reactor, and col. 4 lines 52-54, where Williams indicates that substantial conversion of the fresh feed and recycle naphtha to low molecular-weight olefins occurs in section 10 of his reactor). There is no indication in Williams that a person of ordinary skill would expect isoparaffin content to increase by increasing the ratio of diameter of second reaction zone to diameter of first reaction zone.

The Office Action therefore does not establish the requisite facts to support a rejection that the claimed subject matter is obvious.

Dr. Youhao’s declaration at pages 13-15 explains how the cited references do not suggest to one of ordinary skill that dimensions of zones in the riser could be varied to optimize the reaction conditions in the manner that Dr. Youhao changed them. Dr. Youhao explains how a person of ordinary skill would approach optimization of the reactor based on conventional wisdom at the time of the invention to obtain the desired product distribution, and that the person of ordinary skill, following conventional wisdom, would arrive at an unreasonably tall reactor that still did not suggest the reactor of Applicant’s claims or one in which the diameter ratio would be only 1.225:1. Dr. Youhao explains at pages 15-24 how Kmecak et al. would necessarily provide a reactor in which the ratio of diameter of the second reaction zone to diameter of first reaction zone would not exceed 1.5:1, to say nothing of 3.0:1 in the reference EP0171460 (Kmecak et al.) as alleged by the Examiner. There is, therefore, nothing in the references cited in the Office Action that would lead a person of ordinary skill to the claimed subject matter.

In view of the above, claims 1-3, 6, 7, 9-11, 14, 15, 17-23, 25-27, 30, 31, 33-35, 38, 39, 49-51 and 54-57 are patentable over the art cited in the Office Action. Applicant respectfully requests withdrawal of the rejection.

Claims 8, 16, 24, 32, and 40 were rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Kmecak et al. in view of Williams as applied to claims 1, 9, 17, 25, and 33, and further in view of Watts (US 2,377,657).

Claims 8, 16, 24, 32, and 40 are patentable for the reasons discussed above. Nothing in Watts cures the deficiencies of Kmecak et al. and Williams as applied to claims 1, 9, 17, 25, and 33. Consequently, Applicant respectfully requests withdrawal of the rejection of these claims.

Claims 52, 53 and 58 were rejected under 35 USC § 103(a) as allegedly being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams (US 4,422,925), as applied to claim 1, and further in view of Carr et al. (US 3,639,228).

Claims 52, 53, and 58 are patentable for the reasons discussed above. Nothing in Carr et al. cures the deficiencies of the references cited in the Office Action.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to ***Deposit Account No. 03-1952*** referencing docket no. **456962000200**. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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